

heating apparatus, a series of vessels placed together, in which hot water circulated. After being thus warmed, the air passed into a flue, and so upwards in the brick-work of the walls to any part of the house. He had generally thought it best to introduce it into the apartments near the windows, so as to check the current of cold air in that part of the room. He believed it had been found that, by introducing the air at the bottom of the room, the draught became so rapid as to prevent the ventilation of the upper part of the room, and that was one reason for proposing to introduce it at the top.

THE INSTITUTE OF BRITISH ARCHITECTS.

The following is a list of the office-bearers elected for the ensuing year:—*President*—Earl de Grey. *Vice Presidents*—C. R. Cockrell, C. Fowler, P. Hardwick. *Honorary Secretaries*—J. J. Scoles, C. C. Nelson. *Honorary Secretary for Foreign Correspondence*—T. L. Donaldson. *Honorary Solicitor*—W. L. Donaldson. *Ordinary Members of Council*—J. B. Bunning, T. T. Bury, B. Ferrey, H. Garling, J. Jennings, H. E. Kendall, jun., J. W. Papworth, G. G. Scott, Sancton Wood, E. Woodthorpe. *Treasurer*—Sir W. R. Farquhar, Bart. *Auditors*—E. Christian, Fellow; S. J. Nicholl, Associate.

THE INTERNATIONAL EXHIBITION.

MACHINES IN MOTION.

ONE of the lions in this department of the Exhibition is Appold's Centrifugal Pump, which seems indeed to rank next, in attraction as well as in noise, to Applegath's wonderful printing machine, by which *The Times* and *The Illustrated News* are printed. By means of a little wheel, 12 inches in diameter, with twisted apertures, radiating from an open central space, there is made to rise to the roof of the department a mass of water which produces a broad and heavy, noisy, and continuous waterfall that might turn a powerful water-wheel. Of course, however, to produce this striking result, sufficient power is requisite to produce that rapid revolution in the little wheel which does the work. The wheel itself contains only a single gallon of water when its apertures are full, yet, by being made to revolve at the rate of 607 revolutions in a minute, it lifts no less than 1,600 gallons in course of that time; so that it must be filled and emptied about three times in the course of every revolution. In fact, the disc, once under water, where it works, may be said to carry the water through its apertures in continual streams, or threads, or cables rather, of water, forced out at several interspaces by the centrifugal power of its rapid rotation; so that the weaving of such threads of water is not so fruitless a process as the ancient one of twisting ropes of sand. By the way, could not quicksands themselves be very rapidly scooped out by a machine somewhat like this?

The direct purpose of Mr. Appold's invention, which he has most liberally made a present of to the public so far as regards any private patent right which he might have reserved to himself, is for the drainage of marshes; but to this might also be added such other uses as that of clearing cofferdams for docks, &c. Indeed, it is stated by the inventor to be "particularly well adapted for a tide-pump, discharging more water the lower the lift, the pump going the same speed; while other pumps discharge only their contents, no matter how low the lift." The machine at work was manufactured by Messrs. Easton and Amos, of Southwark. We examined the interior of the perpendicular leader, if we may so call it, through which the water is lifted from a narrow slope below, in order to assure ourselves that the disc or wheel was of something like the dimensions stated. A small one was also exhibited, which, though only three inches in diameter, evolved 150 gallons a minute, and sent a strong jet up to the roof. A modification of Mr. Appold's invention, though called "Bessemer's centrifugal disc-pump for draining land," is also exhibited. The disc is 6 feet in diameter, and it discharges 20 tons a

minute. There are also other interesting forms of the same centrifugal principle, such as a disc-pump for locomotive engines.

Near these machines Messrs. Holtzapffel & Co. have erected a pretty little miniature shop, containing specimens of ornamental and fancy turning, an amateur turning-lathe, and other apparatus; and behind this curiosity-shop we have another erection, to show "the imperishable water-shoot" for the improvement of labourers' cottages and other buildings, by dispensing with all external wood and metallic work on roofing: the invention consists simply of a tile eave-gutter, in place of a leaden, zinc, or wooden one. The roof-tiles, or slates, of course, lap over this gutter, which takes the place of the edge-row. The only "machinery in motion" here is a stream of water issuing from pipes, and running, as rain does, over the roof and into the tile-gutter. The mode of joining the lengths of gutter, an important point, seems questionable.

Armstrong, of Newcastle, has several of his simple and useful hydraulic machines at work near this spot. The rapid wheelings, liftings, and lowerings of a little model crane, with a comparatively heavy weight attached, speak well for the utility of an invention which we long since recognized as a hopeful one, whether applied to cranes or to various other purposes, wherever a common water-pipe can be laid on with water from a proper level. A machine for hoisting sacks is also exhibited.

The next machine we have noted is a model sawing-machine for quarry work, sent from Bath, by Messrs. Randall and Saunders, of Orange Grove, who have the original, and we believe as yet the only one, in use at their quarries at Corsham. By this machine the stone is cut from its natural rock according to the thickness of each stratum, the saws only cutting in the line of depth, or rather at an angle of about 45 degrees. The strata, as illustrated on the model, assume, under the operation of this machine, the shape of a flight of steps, and the saws run from top to bottom, and simply cut into the face of the whole flight. The apparatus, at the Corsham Quarry, works eight saws, which are 24 feet long. By a simple arrangement each saw is allowed an action independent of the others, and can be worked at any angle. In case of an impediment, it is arranged for either saw to stop before it is strained, and without interfering with the action of the others. This machine does the work of seventy men. When the stone is cut out into blocks, it is removed by a traversing crane worked by the same ropes which work the saw frame, and both are driven by steam power. The same persons exhibit a model of their balance saw-frame, which is constructed on a new principle for sawing blocks of stone, marble, &c., either by steam, horse, or hand power; and with this machine is shown a model of a portable balance hand-saw frame, for working one or more saws by hand power for cutting stone or marble. Both are worked at an angle, like the quarry saw.

Messrs. Randall and Saunders also exhibit a brick and pipe making machine with double screw press and perpetual cutter, adapted for making their patent draining bricks, for sewerage purposes, and of which a description has appeared in our pages.

A patent rivetted-iron, square-cellular crane, rising in the form of a quarter of a circle set on end, with the chains running through the interior of the tube, is exhibited by Mr. Fairbairn, of Manchester. Its height is probably 18 to 20 feet. The same manufacturer exhibits an improved patent rivetting machine, of massive proportions. Near it is another from Dukinfield's iron works,—Garforth's patent direct-acting steam-rivetting machine for steam boilers, &c. The advantage of such machines is said to be that, while the repeated impacts or strokes, formerly necessary, rendered the heads of the rivets liable to give way in finishing, repeated hammering tending to crystallise the iron, and thus to destroy its tenacity, here the effect is produced by instantaneous pressure. The hemispherical form, too, is given to the rivet, and is preferable to the conical, both as regards strength and appearance. A large

high-pressure boiler, furnishing steam for the machinery in motion, it is said, was made by this latter machine, and proved to stand 150 lb. per square inch.

A striking-looking machine, though not a very new one, is Ryder's patent forge for iron or steel, the strokes of its little hammers on its anvils being so rapidly reiterated, that the apparatus looks as if it were in a state of mere constant vibration. The anvils and hammers shipped while we saw it were adapted for rounding a bar of iron into something like a spindle. Red-hot iron was represented by cold lead, which rapidly assumed the form of a clean spindle four or five times the original length of the lead.

The steam travelling crane of Messrs. McNicol and Vernon, of Liverpool, may next be noticed, though it cannot be easily described without engravings. It consists of an elevated framework, with a sort of skeleton railway, supposed to run aloft along the course of a timber or stone yard, or other space where logs, stones, &c., require to be moved about. It has three motions, a hoisting, a longitudinal, and a transverse, each of which may be worked separately, or any two of them together. The machine is said to be able to load five tons, and shift it 100 feet in a direct line, in forty-five seconds. Ten thousand and twenty-five logs of Quebec timber are said to have been lately shifted in nineteen minutes twenty seconds by it at Liverpool, in presence of some members of the council and about thirty other gentlemen.

A somewhat ponderous congeries of pipes in this department is called The Fuel Economiser for Engines of 100 horse power, Green's patent. Its purpose is to convey heated water into the boilers at the boiling point, the feed water being heated by the spare heat from the boiler flues to boiling heat, and a considerable quantity of steam generated before it enters the boiler, thereby saving, it is said, one-third to one-fourth of the fuel. The apparatus can be applied to boilers of any description, stationary or marine.

A sea-water freshening machine, — Fell's patent, — is said to produce 200 gallons of fresh water a day from sea water. The principle of this invention, which has only been patented about two months, consists in keeping the water to be freshened below the boiling point, whereby its vapour is more easily managed, and more rapidly condensed and cooled than could be done by the usual process of distillation.

Machines for spinning, weaving, and printing cotton and flax, lace machines, and such like, form a very considerable portion of the whole exhibition of machines in motion. It is a most interesting sight to see these at work, and we cannot help remarking, that nothing more curious or beautiful can be seen in all the exhibition of machinery in motion than the many modes in which human actions are simulated, such as the whisk of the weaver's arm in the sudden hitch by which he sends the shuttle from side to side, or in the movement of the shoulder, elbow, wrist joint, knee, and foot, by which other familiar operations are performed. One ingenious little machine bristles an india-rubber band with carding-needles, bending, angling, and cutting every wire as it threads it on, in a way that looks really quite magical.

Amongst the lighter order of machines are those for making envelopes, which constitute centres of attraction for the visitors, as does a simple little apparatus into which pins go bigley-pigley, and come out all ready stuck in radi round a new sort of pin-paper, into which they "take their places" in a way that seems to astonish both "ladies and gentlemen." Round the ornamental pin-paper is the somewhat old motto for so sharp and lancinating a little weapon—"Peace on earth and good will to men!" but such a seed, sown where it may be, can but do good.

One of the machine-made barrels, of good stout build, may be seen in this department: it is said to have been made in five minutes, by the patentee, Mr. W. Wild, of Salford.

We may here mention that Messrs. Clowes